The documentation and process conversion measures necessary to comply with this document shall be completed by 8 September, 2004.

INCH-POUND

MIL-PRF-19500/355J
8 July 2004
SUPERSEDING
MIL-PRF-19500/355H
14 August 2001

* PERFORMANCE SPECIFICATION SHEET

SEMICONDUCTOR DEVICE, UNITIZED DUAL TRANSISTOR, NPN, SILICON TYPES 2N2919, 2N2920, 2N2919L, 2N2920L, 2N2919U, AND 2N2920U, JAN, JANTX, JANTXV, JANS, JANHC, AND JANKC

This specification is approved for use by all Departments and Agencies of the Department of Defense.

* The requirements for acquiring the product described herein shall consist of this specification sheet and MIL-PRF-19500.

1. SCOPE

1.1 Scope. This specification covers the performance requirements for two electrically isolated, matched NPN silicon transistors as one dual unit. Four levels of product assurance are provided for each device type as specified in MIL-PRF-19500. Two levels of product assurance are provided for die.

1.2 Physical dimensions. See figure 1 (similar to TO-78), figure 2 (surface mount), figure 3 (JANHCA and JANKCA die), figure 4 (JANHCB and JANKCB die).

* 1.3 Maximum ratings, unless otherwise specified, T_C =+ 25°C.

I_C	V_{CBO}	V_{EBO}	V_{CEO}	T_J and T_{STG}
mA dc	V dc	V dc	V dc	°C
30	70	6	60	-65 to +200

Types	P_T T_A = +25°C (1)		P_T T_C = +25°C (2)		$R_{\theta JA}$ T_A = +25°C		$R_{\theta JC}$ T_C = +25°C	
	One section	Both sections	One section	Both sections	One section	Both sections	One section	Both sections
	mW	mW	mW	W	°C/W	°C/W	°C/W	°C/W
2N2919	300	600	750	1.25	580	290	230	140
2N2920	300	600	750	1.25	580	290	230	140
2N2919L	300	600	750	1.25	580	290	230	140
2N2920L	300	600	750	1.25	580	290	230	140
2N2919U			750	1.25			230	140
2N2920U			750	1.25			230	140

* (1) For T_A > +25°C, derate linearly 1.71 mW/°C, one section; 3.43 mW/°C, both sections.
* (2) For T_C > +25°C, derate linearly 4.286 mW/°C, one section; 7.14 mW/°C, both sections.

* Comments, suggestions, or questions on this document should be addressed to Defense Supply Center, Columbus, ATTN: DSCC-VAC, P.O. Box 3990, Columbus, OH 43218-3990, or emailed to Semiconductor@dscc.dla.mil. Since contact information can change, you may want to verify the currency of this address information using the ASSIST Online database at http://www.dodssp.daps.mil/.

1.4 Primary electrical characteristics of each individual section, unless otherwise specified, T_C =+25°C.

	h_{FE1}		$\|h_{fe}\|$	$V_{CE(SAT)}$
	V_{CE} = 5 V dc I_C = 10 µA dc		V_{CE} = 5 V dc I_C = 0.5 mA dc f = 20 MHz	I_C = 1 mA dc I_B = 100 µA dc
	2N2919 2N2919L 2N2919U	2N2920 2N2920L 2N2920U		
				V dc
Min	60	175	3.0	
Max	240	600	20	0.3

1.5 Primary electrical matching characteristics of each individual section, unless otherwise specified, T_C =+25°C.

	$\frac{h_{FE2-1}}{h_{FE2-2}}$ V_{CE} = 5 V dc I_C = 100 µA dc (1)	$\|V_{BE1} - V_{BE2}\|_1$ V_{CE} = 5 V dc I_C = 10 µA dc	$\|\Delta(V_{BE1} - V_{BE2})_{\Delta TA}\|_1$ V_{CE} = 5 V dc I_C = 100 µA dc T_A = +25°C and -55°C	$\|\Delta(V_{BE1} - V_{BE2})_{\Delta TA}\|_2$ V_{CE} = 5 V dc I_C = 100 µA dc T_A = +125°C and +25°C
		mV dc	mV dc	mV dc
Min	0.9			
Max	1.0	5	0.8	1.0

(1) The larger number shall be placed in the denominator.

2. APPLICABLE DOCUMENTS

* 2.1 General. The documents listed in this section are specified in sections 3, 4, or 5 of this specification. This section does not include documents cited in other sections of this specification or recommended for additional information or as examples. While every effort has been made to ensure the completeness of this list, document users are cautioned that they must meet all specified requirements of documents cited in sections 3, 4, or 5 of this specification, whether or not they are listed.

2.2 Government documents.

* 2.2.1 Specifications, standards, and handbooks. The following specifications, standards, and handbooks form a part of this document to the extent specified herein. Unless otherwise specified, the issues of these documents are those cited in the solicitation or contract.

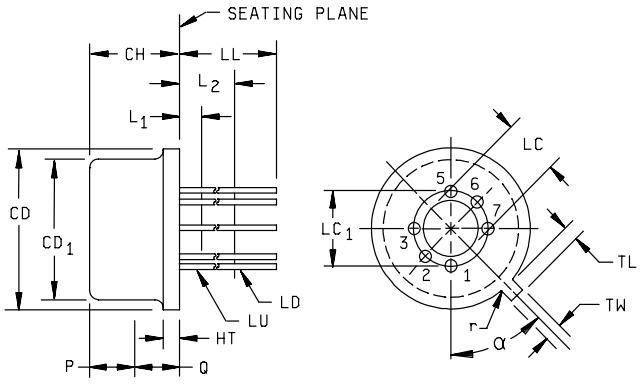
DEPARTMENT OF DEFENSE SPECIFICATIONS

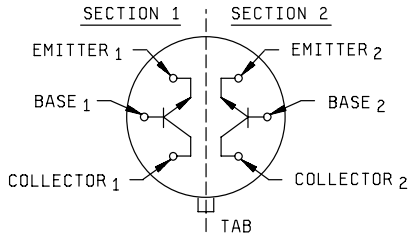
MIL-PRF-19500 - Semiconductor Devices, General Specification for.

DEPARTMENT OF DEFENSE STANDARDS

MIL-STD-750 - Test Methods for Semiconductor Devices.

* (Copies of these documents are available online at http://assist.daps.dla.mil/quicksearch/ or http://www.dodssp.daps.mil/ or from the Standardization Document Order Desk, 700 Robbins Avenue, Building 4D, Philadelphia, PA 19111-5094.)



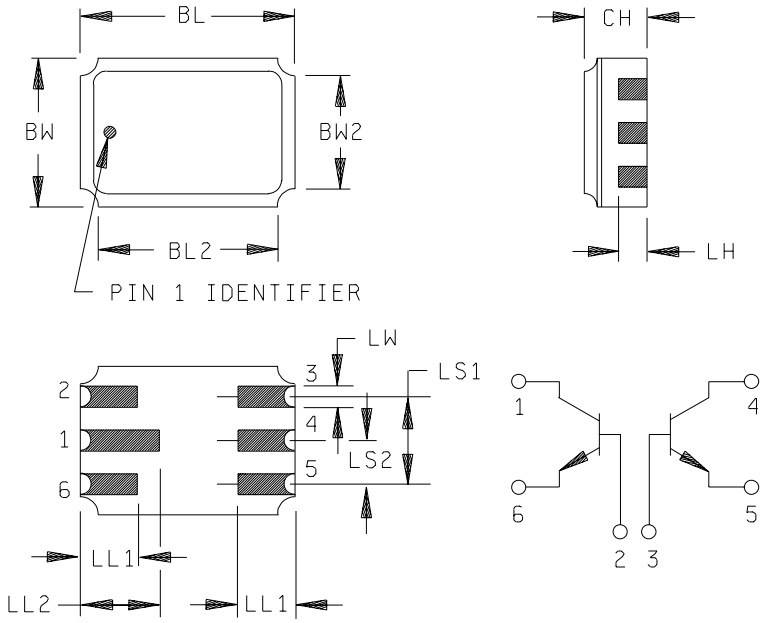


CONNECTION DIAGRAM

Symbol	Dimensions				Notes
	Inches		Millimeters		
	Min	Max	Min	Max	
CD	.335	.370	8.51	9.40	
CD_1	.305	.335	7.75	8.51	
CH	.140	.260	3.56	6.60	
HT	.009	.041	0.23	1.04	
LC	.140	.160	3.56	4.06	
LC_1	.200 TP		5.08 TP		9
LD	.016	.021	.041	0.53	10
LL	See notes 10, 11, and 12				
LU	.016	.019	0.41	0.48	10
L_1		.050		1.27	10
L_2	.250		6.35		10
P	.100		2.54		8
Q		.050		1.27	7
TL	.029	.045	0.74	1.14	5, 6
TW	.028	.034	0.71	0.86	4, 5
r		.010		1.27	
α	45°TP		45°TP		9

NOTES:
1. Dimensions are in inches.
2. Millimeters are given for general information only.
3. Tab shown omitted.
4. Lead numbers 4 and 8 are omitted on this variation.
5. Beyond r maximum, TW shall be held to a minimum length of .21 inch (0.53 mm).
6. TL shall be measured from maximum CD.
7. Details of outline in this zone are optional.
8. CD_1 shall not vary more than .010 inch (0.25 mm) in zone P. This zone is controlled for automatic handling.
9. Leads at gauge plane .054 - .055 inch (1.37 - 1.40 mm) below seating plane shall be within .007 inch (0.18 mm) radius of true position (TP) at a maximum material condition (MMC) relative to the tab at MMC. The device may be measured by direct methods or by the gauge and gauging procedures described on gauge drawing GS-1.
10. LU applies between L_1 and L_2. LD applies between L_2 and LL minimum. Diameter is uncontrolled in L_1 and beyond LL minimum.
11. For transistor types 2N2919 and 2N2920, LL is .500 inch (12.70 mm) minimum and .750 inch (19.05 mm) maximum.
12. For transistor type 2N2919L and 2N2920L, LL is 1.500 inches (38.10 mm) minimum and 1.750 inches (44.45 mm) maximum.
13. In accordance with ASME Y14.5M, diameters are equivalent to ϕx symbology.

FIGURE 1. Physical dimensions (2N2919, 2N2919L, 2N2920, and 2N2920L).

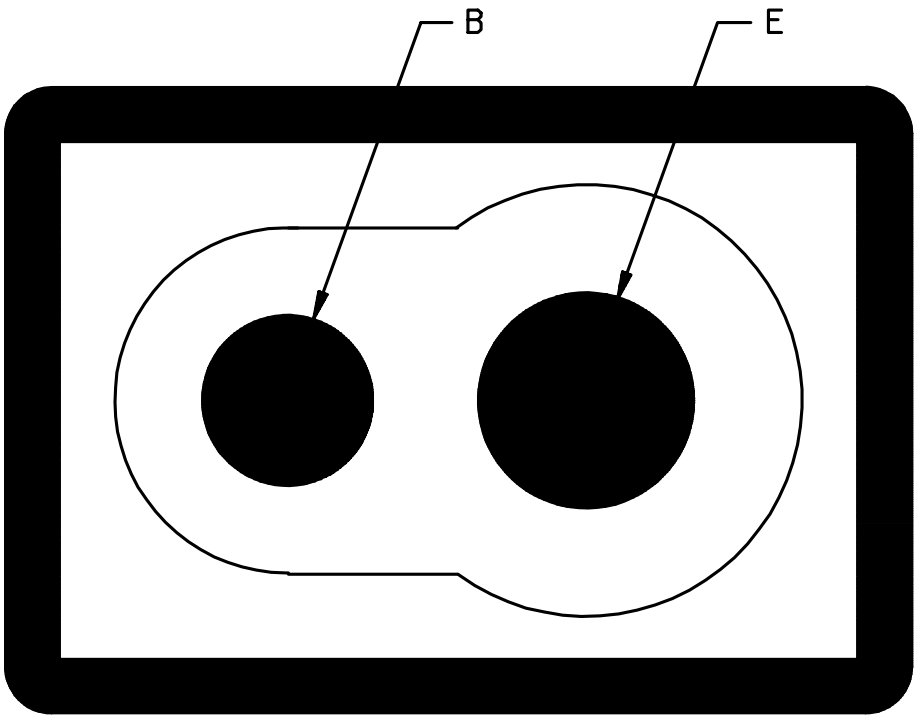


Symbol	Dimensions			
	Inches		Millimeters	
	Min	Max	Min	Max
BL	.240	.250	6.10	6.35
BL_2		.250		6.35
BW	.165	.175	4.19	4.44
BW_2		.175		4.44
CH	.044	.080	1.12	2.03
LH	.014	.034	0.36	0.86
LL_1	.060	.070	1.52	1.78
LL_2	.082	.098	2.08	2.49
LS_1	.095	.105	1.14	2.67
LS_2	.045	.055	1.14	1.39
LW	.022	.028	0.56	0.71

Pin no.	Transistor
1	Collector no. 1
2	Base no. 1
3	Base no. 2
4	Collector no. 2
5	Emitter no. 2
6	Emitter no. 1

NOTES:
1. Dimensions are in inches.
2. Millimeters are given for general information only.
3. In accordance with ASME Y14.5M, diameters are equivalent to ϕx symbology.

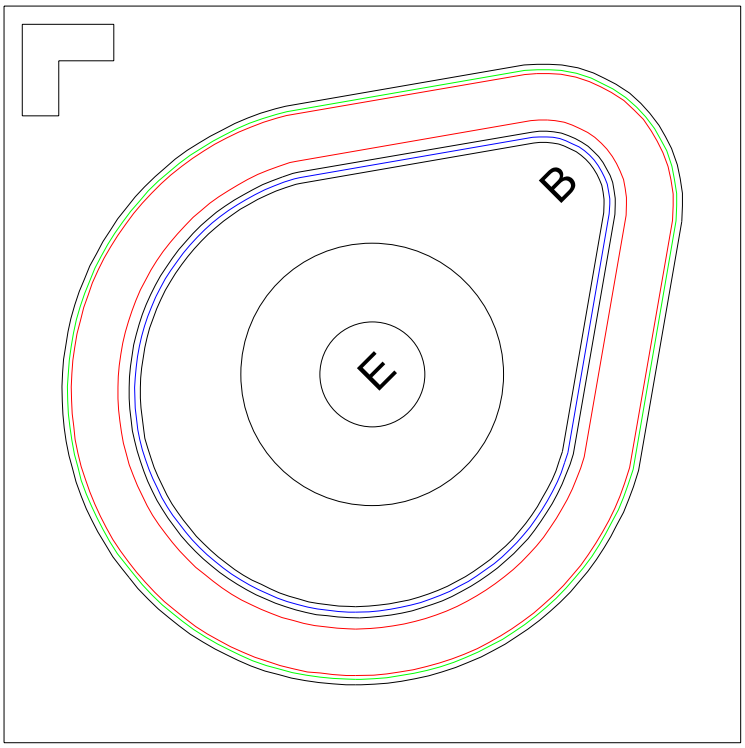
FIGURE 2. Physical dimensions (2N2919U and 2N2920U) surface mount.



NOTES:

1.	Chip size	.015 x .019 inch ±.001 inch (0.381 x 0.4826 mm ±0.0254 mm).
2.	Chip thickness	.010 ±.0015 inch (0.254 ±0.0381 mm).
3.	Top metal	Aluminum 15,000Å minimum, 18,000Å nominal.
4.	Back metal	A. Gold 2,500Å minimum, 3,000Å nominal. B. Eutectic Mount - No Gold.
5.	Backside	Collector.
6.	Bonding pad	B = .003 inch (0.0762 mm), E = .004 inch (0.1016 mm) diameter.
7.	Passivation	Si_3N_4 (Silicon Nitride) 2 kÅ min, 2.2 kÅ nom.

FIGURE 3. Physical dimensions (JANHCA and JANKCA die).



NOTES:
1. Die size--------- .018 x .018 inch (0.457 mm x 0.457 mm).
2. Die thickness--- .008 ±.0016 inch (0.203 mm ±0.04 mm).
3. Base pad-------- .0025 inch diameter (0.06 mm).
4. Emitter pad----- .003 inch diameter (0.076).
5. Back metal----- Gold, 6500 ±1950Å.
6. Top metal------ Aluminum, 19500 ±2500Å.
7. Back side------ Collector.
8. Glassivation--- SiO_2, 7500 ± 1500Å.

FIGURE 4. Physical dimensions (JANHCB and JANKCB) B version die.

2.3 Order of precedence. In the event of a conflict between the text of this document and the references cited herein, the text of this document takes precedence. Nothing in this document, however, supersedes applicable laws and regulations unless a specific exemption has been obtained.

3. REQUIREMENTS

* 3.1 General. The individual item requirements shall be as specified in MIL-PRF-19500 and as modified herein.

3.2 Qualification. Devices furnished under this specification shall be products that are manufactured by a manufacturer authorized by the qualifying activity for listing on the applicable qualified manufacturer's list (QML) before contract award (see 4.2 and 6.3).

* 3.3 Abbreviations, symbols, and definitions. Abbreviations, symbols, and definitions used herein shall be as specified in MIL-PRF-19500 and as follows:

$\frac{h_{FE-1}}{h_{FE-2}}$ ..... Static forward-current-gain-ratio. The matching ratio of the static forward-current transfer ratios of each section.

$|V_{BE1} - V_{BE2}|$ ..... Absolute value of base-emitter-voltage differential between the individual sections.

$|\Delta V_{BE1-2}\ (T1) - \Delta V_{BE1-2}\ (T2)|$ ..... Absolute value of the algebraic difference between the base-emitter-voltage differentials between the individual sections at two different temperatures.

* $R_{\theta JA}$ ..... Thermal resistance junction to ambient.

* $R_{\theta JSP(IS)}$ ..... Thermal resistance junction to solder pads (infinite sink mount to PCB).

3.4 Interface and physical dimensions. The interface and physical dimensions shall be as specified in MIL-PRF-19500 and on figures 1, 2, 3, and 4.

3.4.1 Lead finish. Lead finish shall be solderable in accordance with MIL-PRF-19500, MIL-STD-750, and herein. Where a choice of lead finish is desired, it shall be specified in the acquisition document (see 6.2).

* 3.5 Electrical performance characteristics. Unless otherwise specified herein, the electrical performance characteristics are as specified in 1.3, 1.4, and 1.5.

* 3.6 Electrical test requirements. The electrical test requirements shall be table I as specified herein.

3.7 Marking. Marking shall be in accordance with MIL-PRF-19500.

3.8 Workmanship. Semiconductor devices shall be processed in such a manner as to be uniform in quality and shall be free from other defects that will affect life, serviceability, or appearance.

4. VERIFICATION

* 4.1 Classification of inspections. The inspection requirements specified herein are classified as follows:

a. Qualification inspection (see 4.2).

b. Screening (see 4.3).

c. Conformance inspection (see 4.4 and table I and II).

4.2 Qualification inspection. Qualification inspection shall be in accordance with MIL-PRF-19500 and as specified herein.

4.2.1 JANHC and JANKC die. Qualification shall be in accordance with MIL-PRF-19500.

* 4.2.2 Group E qualification. Group E inspection shall be performed for qualification or re-qualification only. In case qualification was awarded to a prior revision of the specification sheet that did not request the performance of table II tests, the tests specified in table II herein shall be performed by the first inspection lot of this revision to maintain qualification.

* 4.3 Screening (JANS, JANTXV, and JANTX levels only). Screening shall be in accordance with table IV of MIL-PRF-19500, and as specified herein. The following measurements shall be made in accordance with table I herein. Devices that exceed the limits of table I herein shall not be acceptable.

Screen (see table IV of MIL-PRF-19500)	Measurement	
	JANS level	JANTX and JANTXV levels
3c	Thermal impedance, method 3131 of MIL-STD-750 (see 4.3.2)	Thermal impedance, method 3131 of MIL-STD-750 (see 4.3.2)
9	I_{CBO2}, h_{FE3}, $\frac{h_{FE2-1}}{h_{FE2-2}}$	Not applicable
10	48 hours minimum	48 hours minimum
11	I_{CBO2}, h_{FE3}, $\frac{h_{FE2-1}}{h_{FE2-2}}$ ΔI_{CBO2} = 100 percent of initial value or 1 nA dc, whichever is greater. Δh_{FE3} = ±20 percent.	I_{CBO2}, h_{FE3}, $\frac{h_{FE2-1}}{h_{FE2-2}}$
12	See 4.3.1 240 hours minimum	See 4.3.1 80 hours minimum
13	Subgroups 2 and 3 of table I herein; ΔI_{CBO2} = 100 percent of initial value or 1 nA dc, whichever is greater; Δh_{FE3} = ±25 percent.	Subgroup 2 and the base emitter voltage (nonsaturated) (absolute value of differential-change with temperature) tests of subgroup of table I herein; ΔI_{CBO2} = 100 percent of initial value or 1 nA dc, whichever is greater; Δh_{FE3} = ±25 percent.
14	Required	Required

* 4.3.1 Power burn-in conditions. Power burn-in conditions are as follows: V_{CB} = 10 to 30 V dc; apply maximum rated P_T as defined in 1.3.

4.3.2 Thermal impedance ($Z_{\theta JX}$ measurements). The $Z_{\theta JX}$ measurements shall be performed in accordance with method 3131 of MIL-STD-750.

a. I_H forward heating current ----------50 mA (min).

b. t_H heating time ----------25 - 30 ms.

c. I_M measurement current ----------5 mA.

d. t_{md} measurement delay time --------60 μs max.

e. V_{CE} collector-emitter voltage --------10 V dc minimum.

The maximum limit for $Z_{\theta JX}$ under these test conditions are $Z_{\theta JX}$ (max) = 72°C/W.

* 4.3.3 Screening (JANHC and JANKC). Screening of JANHC and JANKC die shall be in accordance with MIL-PRF-19500, “Discrete Semiconductor Die/Chip Lot Acceptance”. Burn-in duration for the JANKC level follows JANS requirements; the JANHC follows JANTX requirements.

4.4 Conformance inspection. Conformance inspection shall be in accordance with MIL-PRF-19500, and as specified herein. If alternate screening is being performed in accordance with MIL-PRF-19500, a sample of screened devices shall be submitted to and pass the requirements of group A1 and A2 inspection only (table VIb, group B, subgroup 1 is not required to be performed again if group B has already been satisfied in accordance with 4.4.2).

4.4.1 Group A inspection. Group A inspection shall be conducted in accordance with MIL-PRF-19500, and table I herein.

4.4.2 Group B inspection. Group B inspection shall be conducted in accordance with the conditions specified for subgroup testing in table VIa (JANS) of MIL-PRF-19500 and 4.4.2.1 herein. Electrical measurements (end-points) and delta requirements shall be in accordance with table I, subgroup 2 and 4.5.8 herein. See 4.4.2.2 for JAN, JANTX, and JANTXV group B testing. Electrical measurements (end-points) and delta requirements for JAN, JANTX, and JANTXV shall be after each step in 4.4.2.2 and shall be in accordance with table I, subgroup 2 and 4.5.8 herein.

* 4.4.2.1 Group B inspection, table VIa (JANS) of MIL-PRF-19500.

Subgroup	Method	Condition
B4	1037	V_{CB} = 10 V dc
B5	1027	V_{CB} = 10 V dc, $P_D \geq$ 100 percent of maximum rated P_T (see 1.3). (NOTE: If a failure occurs, resubmission shall be at the test conditions of the original sample.) Option 1: 96 hours min, sample size in accordance with table VIa of MIL-PRF-19500, adjust T_A or P_D to achieve T_J = +275°C minimum. Option 2: 216 hours min., sample size = 45, c = 0; adjust T_A to achieve T_J = +225°C minimum.

* 4.4.2.2 Group B inspection, (JAN, JANTX, and JANTXV). Separate samples may be used for each step, in the event of a lot failure, the manufacturer may pull a new sample at double the sample size from ether the failed or from another assembly lot from the same wafer lot. If the new "assembly lot" option is exercised, the failed lot shall be scrapped.

Step	Method	Condition
1	1039	Steady-state life: Test condition B, 1,000 hours, V_{CB} = 10 V dc, power shall be applied to achieve T_J = +150°C minimum using a minimum of P_D = 75 percent of maximum rated P_T as defined in 1.3. n = 45 devices, c = 0.
2	1039	HTRB: Test condition A, 48 hours minimum. n = 45 devices, c = 0.
3	1032	High-temperature life (non-operating), t = 340 hours, T_A = +200°C. n = 22, c = 0.

4.4.2.3 Group B sample selection. Samples selected from group B inspection shall meet all of the following requirements:

a. For JAN, JANTX, and JANTXV samples shall be selected randomly from a minimum of three wafers (or from each wafer in the lot) from each wafer lot. For JANS, samples shall be selected from each inspection lot. See MIL-PRF-19500.

b. Must be chosen from an inspection lot that has been submitted to and passed table I, subgroup 2, conformance inspection. When the final lead finish is solder or any plating prone to oxidation at high temperature, the samples for life test (subgroups B4 and B5 for JANS, and group B for JAN, JANTX, and JANTXV) may be pulled prior to the application of final lead finish. See MIL-PRF-19500.

4.4.3 Group C inspection, Group C inspection shall be conducted in accordance with the conditions specified for subgroup testing in table VII of MIL-PRF-19500, and in 4.4.3.1 (JANS) and 4.4.3.2 (JAN, JANTX, and JANTXV) herein for group C testing. Electrical measurements (end-points) and delta requirements shall be in accordance with table I, subgroup 2 and 4.5.8 herein.

* 4.4.3.1 Group C inspection, table VII (JANS) of MIL-PRF-19500.

Subgroup	Method	Condition
C2	2036	Test condition E, not applicable to surface mount.
* C5	3131	$R_{\theta JA}$ (see 1.3).
C6	1026	1,000 hours at V_{CB} = 10 V dc; T_J = +150°C minimum, external heating of the device under test to achieve T_J = +150°C minimum is allowed provided that a minimum of 75 percent of rated power is dissipated. No heat sink or forced-air cooling on device shall be permitted.

* 4.4.3.2 Group C inspection, table VII (JAN, JANTX, and JANTXV) of MIL-PRF-19500.

Subgroup	Method	Condition
C2	2036	Test condition E, not applicable to surface mount.
C5	3131	$R_{\theta JA}$ (see 1.3).
C6		Not applicable.

4.4.3.3 Group C sample selection. Samples for subgroups in group C shall be chosen at random from any inspection lot containing the intended package type and lead finish procured to the same specification which is submitted to and passes table I tests for conformance inspection. When the final lead finish is solder or any plating prone to oxidation at high temperature, the samples for C6 life test may be pulled prior to the application of final lead finish. Testing of a subgroup using a single device type enclosed in the intended package type shall be considered as complying with the requirements for that subgroup.

4.4.4 Group E inspection. Group E inspection shall be performed for qualification or re-qualification only. If not performed at the time of initial qualification, the tests specified in table II herein must be performed to maintain qualification.

4.5 Method of inspection. Methods of inspection shall be as specified in the appropriate tables and as follows.

4.5.1 Pulse measurements. Conditions for pulse measurement shall be as specified in section 4 of MIL-STD-750.

4.5.2 Testing of units. All specified electrical tests, including end-point tests, shall be performed equally on both sections of the transistor types covered herein, except where the electrical characteristic being evaluated applies to the transistor as a device entity.

4.5.3 Disposition of leads when testing characteristics of each section. During the measurement of the characteristics of each section, the leads of the section not under test shall be open-circuited.

4.5.4 Forward-current-gain ratio. The value for the forward-current-gain ratio for each individual section of a dual unit shall be measured using method 3076 of MIL-STD-750. The forward-current-gain ratio shall be calculated by dividing one of the values by the other. If possible, this ratio shall be measured directly to improve accuracy.

4.5.5 Base-emitter-voltage differential. The base-emitter-voltage differential shall be determined by connecting the emitters of the individual sections together, applying specified electrical test conditions to each individual section in accordance with method 3066 of MIL-STD-750, test condition B, and measuring the absolute value of the voltage between the bases of the individual sections of a dual unit.

4.5.6 Base-emitter-voltage differential change with temperature. The value of the base-emitter-voltage differential shall be measured at the two specified temperatures in accordance with 4.5.5 except that the polarities of the differentials and identities of the individual sections shall be maintained. The absolute value of the algebraic difference between the values at the two temperature extremes shall be calculated. A mathematical formula for this parameter is:

$$|(V_{BE1}(T_1) - V_{BE2}(T_1)) - (V_{BE1}(T_2) - V_{BE2}(T_2))|$$

4.5.7 Noise figure test. Noise figure shall be measured using a model no. 2173C/2181, Quan Tech Laboratories test set, or equivalent. Conditions shall be as specified in table I.

4.5.8 Delta requirements. Delta requirements shall be as specified below:

Step	Inspection	MIL-STD-750		Symbol	Limit	
		Method	Conditions		Min	Max
1	Collector-base cutoff current	3036	Bias condition D, V_{CB} = 45 V dc	ΔI_{CBO2}	100 percent of initial value or 1 nA dc, whichever is greater.	
2	Forward current transfer ratio	3076	V_{CE} = 5 V dc; I_C = 1 mA dc; pulsed see 4.5.1	Δh_{FE3}	±25 percent change from initial reading.	

* TABLE I. Group A inspection.

Inspection 1/	MIL-STD-750		Symbol	Limit		Unit
	Method	Conditions		Min	Max	
Subgroup 1 2/						
Visual and mechanical examination 3/	2071	n = 45 devices, c = 0				
Solderability 3/ 4/	2026	n = 15 leads, c = 0				
Resistance to solvents 3/ 4/ 5/	1022	n = 15 devices, c = 0				
Temp cycling 3/ 4/	1051	Test condition C, 25 cycles. n = 22 devices, c = 0				
Heremetic seal 4/ Fine leak Gross leak	1071	n = 22 devices, c = 0				
Electrical measurements 4/		Table I, subgroup 2				
Bond strength 3/ 4/	2037	Precondition T_A = +250°C at t = 24 hrs or T_A = +300°C at t = 2 hrs n = 11 wires, c = 0				
Decap internal visual (design verification) 4/	2075	n = 4 device, c = 0				
Subgroup 2						
Thermal impedance	3101	See 4.3.2	$Z_{\theta JX}$			°C/W
Collector to base cutoff current	3036	Bias condition D; V_{CB} = 70 V dc	I_{CBO1}		10	µA dc
Emitter to base cutoff current	3061	Bias condition D; V_{EB} = 6 V dc	I_{EBO1}		10	µA dc
Breakdown voltage, collector to emitter	3011	Bias condition D; I_C = 10 mA dc; pulsed (see 4.5.1)	$V_{(BR)CEO}$	60		V dc
Collector to base cutoff current	3036	Bias condition D; V_{CB} = 45 V dc	I_{CBO2}		2	nA dc
Collector to emitter cutoff current	3041	Bias condition D; V_{CE} = 5 V dc	I_{CEO1}		2	nA dc
Emitter to base cutoff current	3061	Bias condition D; V_{EB} = 5 V dc	I_{EBO2}		2	nA dc

See footnotes at end of table.

* TABLE I. Group A inspection - Continued.

Inspection 1/	MIL-STD-750		Symbol	Limit		Unit
	Method	Conditions		Min	Max	
Subgroup 2 - Continued						
Forward-current transfer ratio	3076	V_{CE} = 5 V dc; I_C = 10 μA dc	h_{FE1}			
2N2919, 2N2919L, 2N2919U				60	240	
2N2920, 2N2920L, 2N2920U				175	600	
Forward-current transfer ratio	3076	V_{CE} = 5 V dc; I_C = 100 μA dc	h_{FE2}			
2N2919, 2N2919L, 2N2919U				100	325	
2N2920, 2N2920L, 2N2920U				235	800	
Forward-current transfer ratio	3076	V_{CE} = 5 V dc; I_C = 1 mA dc;	h_{FE3}			
2N2919, 2N2919L, 2N2919U				150	600	
2N2920, 2N2920L, 2N2020U				300	1,000	
Base-emitter saturation voltage	3066	Test condition A; I_C = 1.0 mA dc; I_B = 100 μA dc;	$V_{BE(sat)1}$	0.5	1.0	V dc
Collector-emitter saturation voltage	3071	I_C = 1.0 mA dc; I_B = 100 μA dc;	$V_{CE(sat)1}$		0.3	V dc
Forward-current transfer ratio (gain ratio) 6/	3076	V_{CE} = 5 V dc, I_C = 100 μA dc (see 4.5.4)	$\frac{h_{FE2-1}}{h_{FE2-2}}$	0.9	1.0	
Absolute value of base-emitter-voltage differential	3066	Test condition B; V_{CE} = 5 V dc, I_C = 10 μA dc (see 4.5.5)	$\lvert V_{BE1} - V_{BE2} \rvert_1$		5	mV dc
Absolute value of base-emitter-voltage differential	3066	Test condition B; V_{CE} = 5 V dc, I_C = 100 μA dc (see 4.5.5)	$\lvert V_{BE1} - V_{BE2} \rvert_2$		3	mV dc
Absolute value of base-emitter-voltage differential	3066	Test condition B; V_{CE} = 5 V dc, I_C = 1 mA dc (see 4.5.5)	$\lvert V_{BE1} - V_{BE2} \rvert_3$		5	mV dc
Base-emitter-voltage (nonsaturated) (absolute value of differential change with temperature) 7/	3066	Test condition B; V_{CE} = 5 V dc, I_C = 100 μA dc T_A = +25°C and -55°C (see 4.5.6)	$\lvert \Delta V_{BE1} - V_{BE2} \Delta T_A \rvert_1$		0.8	mV dc
Base-emitter-voltage (nonsaturated) (absolute value of differential change with temperature) 7/	3066	Test condition B; V_{CE} = 5 V dc, I_C = 100 μA dc T_A = +125°C and +25°C (see 4.5.6)	$\lvert \Delta V_{BE1} - V_{BE2} \Delta T_A \rvert_2$		1	mV dc

See footnotes at end of table.

* TABLE I. Group A inspection - Continued.

Inspection 1/	MIL-STD-750		Symbol	Limit		Unit
	Method	Conditions		Min	Max	
Subgroup 3						
High temperature operation		T_A = +150°C				
Collector to base cutoff current	3036	Bias condition D; V_{CB} = 45 V dc	I_{CBO3}		2.5	μA dc
Low temperature operation		T_A = -55°C				
Forward-current transfer ratio	3076	V_{CE} = 5 V dc; I_C = 10 μA dc	h_{FE4}			
2N2919, 2N2919L, 2N2919U				20		
2N2920, 2N2920L, 2N2920U				50		
Subgroup 4						
Small-signal short-circuit input impedance	3201	V_{CE} = 5 V dc; I_C = 1 mA dc; f = 1 kHz	h_{ie}	3	30	kΩ
Small-signal open-circuit reverse voltage transfer ratio	3211	V_{CE} = 5 V dc; I_C = 1 mA dc; f = 1 kHz	h_{re}		1×10^{-3}	
Small-signal open-circuit output admittance	3216	V_{CE} = 5 V dc; I_C = 1 mA dc; f = 1 kHz	h_{oe}		60	μmhos
Small-signal short-circuit forward current transfer ratio (magnitude h_{fe})	3306	V_{CE} = 5 V dc; I_C = 0.5 mA dc; f = 20 MHz	$\lvert h_{fe} \rvert$	3	20	
Open circuit output capacitance	3236	V_{CB} = 5 V dc; I_E = 0 100 kHz ≤ f ≤ 1 MHz	C_{obo}		5	pF
Noise figure	3246	V_{CE} = 5 V dc, I_C = 10 μA dc R_g = 10 kΩ, (see 4.5.7)				
Test 1		f = 100 Hz	F1		5	dB
Test 2		f = 1 kHz	F2		3	dB
Test 3		f = 10 kHz	F3		3	dB

See footnotes at end of table.

* TABLE I. Group A inspection - Continued.

Inspection 1/	MIL-STD-750		Symbol	Limit		Unit
	Method	Conditions		Min	Max	
Subgroup 5 Collector to emitter cutoff current	3041	Bias condition D; V_{CE} = 40 V dc	I_{CES}		20	nA dc
Subgroups 6 and 7 Not required						

1/ For sampling plan see MIL-PRF-19500.
2/ For resubmission of failed table I, subgroup 1, double the sample size of the failed test or sequence of tests. A failure in table I, subgroup 1 shall not require retest of the entire subgroup. Only the failed test shall be rerun upon submission.
3/ Separate samples may be used.
4/ Not required for JANS devices.
5/ Not required for laser marked devices
6/ The larger number shall be placed in the denominator.
7/ When using table I, subgroup 2 as electrical end-points, this test is only required for JANS end-points.

* TABLE II. Group E inspection (all quality levels) - for qualification only.

Inspection	MIL-STD-750		Qualification
	Method	Conditions	
Subgroup 1			12 devices c = 0
Temperature cycling (air to air)	1051	Test condition C, 500 cycles	
Hermetic seal	1071		
Fine leak Gross leak			
Electrical measurements		See table I, subgroup 2 and 4.5.8 herein.	
Subgroup 2			45 devices c = 0
Intermittent life	1037	V_{CB} = 10 V dc, 6,000 cycles.	
Electrical measurements		See table I, subgroup 2 and 4.5.8 herein.	
Subgroups 3			3 devices c = 0
DPA (destructive physical analysis)	2102		
Subgroups 4, and 5			
Not applicable			
Subgroups 6			3 devices c = 0
ESD (electrocstatic discharge)	1020		
Subgroup 8			45 devices c = 0
Reverse stability	1033	Condition A for devices ≥ 400 V, condition B for devices < 400 V.	

5. PACKAGING

5.1 Packaging. For acquisition purposes, the packaging requirements shall be as specified in the contract or order (see 6.2). When actual packaging of materiel is to be performed by DoD or in-house contractor personnel, these personnel need to contact the responsible packaging activity to ascertain packaging requirements. Packaging requirements are maintained by the Inventory Control Point's packaging activities within the Military Service or Defense Agency, or within the Military Service's system commands. Packaging data retrieval is available from the managing Military Department's or Defense Agency's automated packaging files, CD-ROM products, or by contacting the responsible packaging activity.

6. NOTES

(This section contains information of a general or explanatory nature that may be helpful, but is not mandatory.)

6.1 Intended use. The notes specified in MIL-PRF-19500 are applicable to this specification.

6.2 Acquisition requirements. Acquisition documents should specify the following:

a. Title, number, and date of this specification.

b. Packaging requirements (see 5.1).

c. Lead finish (see 3.4.1).

d. Product assurance level and type designator.

6.3 Qualification. With respect to products requiring qualification, awards will be made only for products which are, at the time of award of contract, qualified for inclusion in Qualified Manufacturers List (QML 19500) whether or not such products have actually been so listed by that date. The attention of the contractors is called to these requirements, and manufacturers are urged to arrange to have the products that they propose to offer to the Federal Government tested for qualification in order that they may be eligible to be awarded contracts or orders for the products covered by this specification. Information pertaining to qualification of products may be obtained from Defense Supply Center, Columbus, ATTN: DSCC/VQE, P.O. Box 3990, Columbus, OH 43218-3990 or e-mail vqe.chief@dla.mil.

6.4 Suppliers of JANHC die. The qualified JANHC suppliers with the applicable letter version (example JANHCA2N2919) will be identified on the QML.

JANC ordering information		
PIN	Manufacturer	
	43611	34156
2N2919	JANHCA2N2919 JANKCA2N2919	JANHCB2N2919, JANHCB2N2920 JANKCB2N2919, JANKCB2N2920

6.5 Changes from previous issue. The margins of this specification are marked with asterisks to indicate where changes from the previous issue were made. This was done as a convenience only and the Government assumes no liability whatsoever for any inaccuracies in these notations. Bidders and contractors are cautioned to evaluate the requirements of this document based on the entire content irrespective of the marginal notations and relationship to the last previous issue.

Custodians:
Army - CR
Navy - EC
Air Force - 11
NASA - NA
DLA - CC

Review activities:
Army - AR, MI, SM
Navy - AS, MC
Air Force - 19, 99

Preparing activity:
DLA - CC

(Project 5961-2825)

* NOTE: The activities listed above were interested in this document as of the date of this document. Since organizations and responsibilities can change, you should verify the currency of the information above using the ASSIST Online database at http://www.dodssp.daps.mil/ .